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THE SPECTROSCOPIC VARIABILITY OF UU AQR

The H emission line object UU Aqr (= S196 = PB7088) was found to be an eclipsing cataclysmic variable by Volkov et al. (1985). They derived a photometric period which recently was improved by Goldader and Garnavich (1989) to be 0.163579089 d. A low resolution spectrum presented by Downes and Keyes (1988) shows, besides H, also weak He I and He II emission. To get some information on the phase dependent spectral behavior a few spectra were obtained at the ESO Observatory La Silla / Chile in 1987 and 1988 using the Boller & Chivens spectrograph and a CCD detector attached to the 3.6 m and 1.52 m telescope, respectively. The eight spectra recorded on July 31, 1987 cover the region around H_α (59.5 Å/mm, exp. time 4 min), whereas the 17 spectra taken during three consecutive nights in 1988 (June, 19-21) span the wavelength region from H_α to H_γ (172 Å/mm, exp.time 7-10min). In this note only the strong H_α emission is used for a first closer spectroscopic inspection of the system.

The line shape is variable and indicates several sources of emission within the system: Symmetrical profiles as well as strong asymmetries or even double peaks are present. Therefore, to get the motion of the white dwarf, positions of the broad wings (FWZI ~ 45 Å), representing material in the innermost disc, were measured and the corresponding (heliocentric) radial velocities were folded with the photometric period referring to mid-eclipse as phase zero. Fig. 1 shows the resulting radial velocity curve which indicates $K_1 \sim 160$ km/s and $\gamma \sim 20$ km/s. Spectroscopic and photometric period are obviously identical as judged from the data at hand. The phases of maximum (~0.9) and minimum radial velocity (~0.4 - 0.5) are shifted by about 0.15 with respect to the expected position. Such inconsistencies are known also for other cataclysmic variables. The line profile variations exhibit a quite consistent behaviour through the orbital cycle: A symmetrical shape (phases 0.17 to 0.4) is followed by an asymmetrical profile showing a strong blue component (phases 0.4 to 0.7) which lateron is fading out (phases 0.7 to 0.8). Then the line becomes again symmetrical (phases 0.80 to 0.88) and asymmetrical with a pronounced red

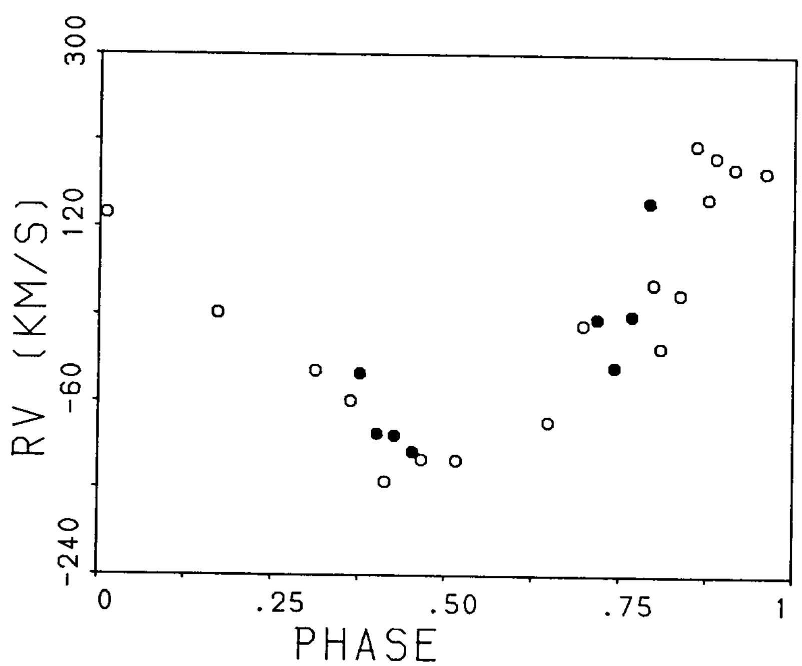

Fig. 1 Radial velocity curve of UU Aqr based on measurements of the broad wings of H_α. Phase zero corresponds to mid-eclipse. Filled circles: observations of 1987, open circles: observations of 1988.

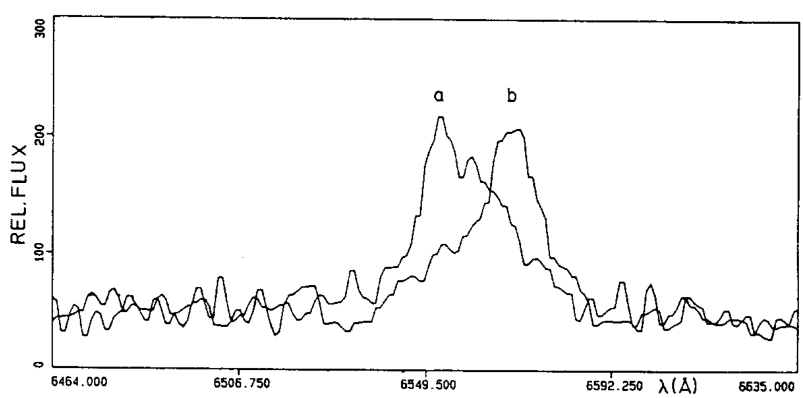

Fig. 2 Strong asymmetries of H_α shown for phases 0.47(a) and 0.01 (b).

component (phases 0.88 to 0.01). Fig. 2 presents two such asymmetrical profiles with a strong blue and red component, respectively. The peaks cover a velocity range of about ± 350 km/s. Whereas the line widths remain nearly constant all the time, the line strengths seem to be reduced by about 40% between phases 0.5 and 0.8 as compared with the average value for the remaining phases. No weakening is observed for the line at phases 0.96 and 0.01 which cover the eclipse. Using 0.37 $M_\odot$ for the mass of the secondary (empirical period - mass - relation, Patterson (1984)) and the mass function of 0.06941 ($\odot$) the mass of the white dwarf may be estimated to be in the range 0.4 to 0.5 $M_\odot$ (inclination between 70^0 and 90^0) which is far below the average white dwarf mass of about 0.9 $M_\odot$ found for cataclysmic variables.

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